

UNITED STATES DEPARTMENT OF COMMERCE  
NATIONAL BUREAU OF STANDARDS  
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THE DURABILITY OF BUILDING PAPERS AND FIBERBOARDS  
RELATIVE TO LOW-COST HOUSING

The objectives, procedure, and scope of the Bureau research program on building materials with respect to their use in low-cost housing, are outlined in Letter Circular 502. Each separate project is described in detail in an additional letter circular such as this. While the research as a whole deals mainly with studies of structural elements, it includes consideration of special problems such as durability, thermal insulation, ventilation, and standardization.

The building materials made from vegetable fibers present interesting possibilities for use in low-cost construction. Adequate data are available on the properties of the materials as manufactured, but with the exception of roofing felts, no data are available to indicate how stable they are under the conditions of use. Hence, the economy of using them in place of more costly materials of known stability is questionable.

I. - Present Information

Very considerable study has been made at the Bureau on roofing felts. For several years the Asphalt Shingle and Roofing Institute has maintained a Research Associate at the Bureau for this purpose. Study has been made of the original properties of felts as compared with their properties after aging for several years and an important finding here is that waste papers, wood pulp and sawdust can be substituted to a certain extent for the more expensive rags used in felt manufacture.<sup>1,2</sup> This work also resulted in development of an accel-

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1BS J. Research 2, 1001 (1929) RP67.

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J. Research NBS 16, 511 (1936) RP888.

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erated weathering test which is now regarded by the industry as standard procedure.<sup>3</sup> With the assistance of a fund from the Works Progress

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3J. Research NBS 16, 481 (1936) RP886.

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Administration, a similar study was made of mineral-surfaced asphalt shingles for the benefit of Federal agencies engaged in housing

activities.<sup>4</sup> The information already obtained on fibrous roofing ma-

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<sup>4</sup>  
J. Research NBS 18, 669 (1937) RP1002.

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terials is considered so comprehensive as to warrant their exclusion from the present program.

The various types of sheathing paper have been studied with reference to thickness, weight, strength, water resistance, and air permeability. They were found to vary greatly in all respects and there was no constant relation between their price and their value as building papers.<sup>5</sup> The data were used as the basis for the formulation

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<sup>5</sup>  
BS J. Research 3, 75 (1929) RP85.

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of Federal Specification UU-P-536 Paper; Sheathing; Waterproof. Two grades are defined in terms of tensile breaking strength, water resistance, and pliability.

Extensive data on the original properties of fiber wall board, such as used for interior finish, and insulating board, have been obtained. These comprise density, weight, thickness, water resistance, expansion with absorption of water, flexural strength, with extent of deflection at rupture,<sup>6</sup> and thermal conductivity.<sup>7, 8</sup> Considerable

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<sup>6</sup>  
Misc. Pub. BS 132 (1931).

<sup>7</sup>  
BS J. Research 5, 973 (1930) RP243.

<sup>8</sup>  
BS Letter Circular 227.

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variation in these products was found. The results of these investigations were used in formulating Federal Specifications UU-W-101a, Wallboard; Composition and LLL-F-321a, Fiber-Board; Insulating. The flexural strength, weight, expansion on absorption of water, are specified for the former; thermal conductivity, flexural strength with deflection at rupture, tensile strength, water absorption, and expansion on absorption of water for the latter.

## II. - Study of Durability

To obtain the missing information on the durability of vegetable fiber building boards and sheathing papers it is necessary to use accelerated aging because normal aging requires too much time. There is immediate need for the information and furthermore the properties of present products may have little relation to those made in the future. However, it is believed that with the considerable experience the Bureau has gained in this direction, not only with roofing materials, but also with papers, paints, textiles, and other materials, the aging procedures and testing planned will yield authentic information. These are as follows:

For insulating boards and sheathing papers for use within walls, heating in dry atmosphere and in atmosphere of high moisture content, alternately. Boards for outside use, exposure on roof and to carbon arc light with controlled intermittent spraying with water, and exposure to alternate high and low temperatures. Boards for interior use, exposure to carbon arc light, and to heating in air of alternate high and low moisture content. Exposure of all materials to rot-producing fungi under conditions conducive to mold growth.

The testing comprises inspection for any noticeable change in appearance, test for mold growth, and for change in strength, pliability, permeability to air and water, and, in the case of insulating board, thermal conductivity. If found desirable to obtain further information to assist in improvement in quality, further tests may be made, such as nature of the fibers, acidity, and amount and kind of water repellent material.

It will not be possible to test all of the commercial products because of the great number of them, nor is this necessary. Very careful selection will be made to make certain that a representative sample of each different type is obtained.

The cooperation of both manufacturers of the materials and of builders is solicited, and any advice received from them will be given very careful consideration.

